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Mother and father language input to young children: Contributions to later language development

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Abstract

There has been little research comparing the nature and contributions of language input of mothers and fathers to their young children. This study examined differences in mother and father talk to their 24 month-old children. This study also considered contributions of parent education, child care quality and mother and father language (output, vocabulary, complexity, questions, and pragmatics) to children's expressive language development at 36 months. It was found that fathers' language input was less than mothers' language input on the following: verbal output, turn length, different word roots, and wh-questions. Mothers and fathers did not differ on type-token ratio, mean length of utterance, or the proportion of questions. At age 36 months, parent level of education, the total quality of child care and paternal different words were significant predictors of child language. Mothers' language was not a significant predictor of child language.

Keywords: Father language input; Mother language input; Child language development; Child care

1. Introduction

Broad changes over the last 30 years in family structure and functioning, including more women in the workforce, extended and less predictable work schedules, and the changing role of men in families, have highlighted the need to include both mothers and fathers in research concerning familial influences on child development. These changes in family structure and functioning have contributed to new ways of conceptualizing the role of fathers in understanding children's development. In previous studies fathers have been found to influence children's development through provisioning of resources and investment in the family (for reviews, see Amato, 1998; Marsiglio, Amato, Day, & Lamb, 2000), but it is necessary for current models of father influence to consider the role father/child relationships in influencing children's development (Lamb, 1997; Marsiglio et al., 2000) and psychological well-being (Amato, 1998). Children, and especially young children, may benefit from interacting with two involved parents who may have different but complementary behavioral styles (Cabrera, Tamis-LeMonda, Bradley, Hofferth, & Lamb, 2000; Guzell & Vernon-Feagans, 2004).

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The possible influence of both mothers and fathers may be especially important when children are very young and acquiring cognitive, language and social skills that undergird later development. Language develops in the context of social relations and has roots in the early interactions of children and caregivers (Bates, 1976; Bruner, 1981; Locke, 2001; Tomasello, 1992). Early language development occurs within, and is affected by, a variety of contexts (Bronfenbrenner, 1979), including familial and nonfamilial environments. Ecological systems theory argues that social interactions with caregivers are examples of proximal processes that are linked to early language development (Bronfenbrenner & Morris, 1998). To gain a more complete understanding of early language development, it is necessary to consider sources of influence from multiple caregivers. For many contemporary families, such influential caregivers include mothers, fathers and nonfamilial child care providers. This research aims to examine the differences between mother and father language input in a group of dual-earner families where fathers have major responsibility for their children and therefore may influence their children's language. This study is also aimed at a more complete consideration the contributions of multiple caregivers (including mothers, fathers, and child care providers) to children's early language development.

1.1. Parent level of education

Several studies have found links between SES and early language development (Fish & Pinkerman, 2003; Hart & Risley, 1995; Hoff-Ginsburg, 1998). Hoff-Ginsburg (1998) found effects of SES even when looking at middle-class and upper-middle-class samples in that children from high-SES families used a richer vocabulary of object labels than did children from mid-SES families.

One way maternal education may influence early language development is through maternal language input (Hoff-Ginsberg, 1991). Previous research has found links between SES and maternal vocabulary and mean length of utterance during mother–child interactions (Hart & Risley, 1995; Hoff, 2003). Hammer and Weiss (1999) found that among 12 African American mothers from low- and mid-SES groups, mothers in the mid-SES group included more language goals in their play, and labeled, commented and imitated children's vocalizations more often than did mothers in the low-SES group. The authors hypothesized that observed group differences may be related to mothers' educational experiences. That is, mothers with higher levels of education might use more behaviors that are valued in school, such as play that incorporates more language goals.

While these findings suggest the possible importance of maternal level of education to both maternal language input and child language development, many studies that have controlled for maternal level of education or SES when considering the impact of parental language input on early language development have considered primarily low-income families (Pan, Rowe, Singer, & Snow, 2005; Weizman & Snow, 2001). Further, very few studies have controlled for the impact of paternal level of education on father language input to their young children. The present study simultaneously considers the impact of both mother and father language input on children's early language development, controlling for the possible impact of maternal and paternal level of education in a relatively homogenous sample of dual-earner middle-SES families.

1.2. Child care quality

While research on caregiver language input has traditionally focused on the influence of mothers' language use, the communicative environment of young children is much broader. Extra-familial factors, such as the quality of center-based child care, have also been found to be associated with children's language development, even as early as one year of age (Burchinal, Roberts, Nabors, & Bryant, 1996).

Several studies have indicated that young children in higher quality child care have stronger expressive and receptive language skills (Feagans, Fendt, & Farran, 1995; McCartney, 1984; NICHD Early Child Care Research Network, 2002). McCartney's (1984) study of child care in Bermuda found that overall quality of care was predictive of early language development. Specifically, children from centers with high levels of caregiver speech performed better on tests of language development than did children from centers with high levels of peer speech. The connection between quality of center-based care and language development during the first 3 years of life has been supported by more recent studies with diverse populations, which have found evidence that higher quality child care predicts higher measures of language development (Burchinal et al., 2000). Specifically, ratings of caregiver responsiveness, sensitivity, and frequency of language stimulation have been linked with early language development (NICHD Early Child Care Research Network, 2000).

The quality of child care may also be related to mother/child language in the home. Vernon-Feagans, Hurley, and Yont (2002) found that among 41 four year-old children enrolled in full time day care, those children from high-quality child care used more words and utterances in a picturebook task with their mothers. They also found that children in high-quality daycare were buffered against many of the negative effects of otitis media on their language skills.

The relationship between the quality of child care and child language has been found even after adjusting for selected child and family characteristics such as SES (Burchinal & Cryer, 2003; Burchinal et al., 2000). It is important to note that whereas the quality of child care accounts for a significant amount of the variance in children's language outcomes, family factors have been found to be more important predictors of these same outcomes (NICHD Early Child Care Research Network, 2000). Therefore, it appears important to consider the family context of language development, even for those children enrolled in full-day child care.

1.3. Parent language input

There is a growing but still modest literature on the relationship between mother and father behavior with their children and children's later development. A number of studies have suggested that mothers and fathers engage in different types of interactions with their children. Specifically, it has been reported that fathers spend a greater proportion of their time interacting with their children in play activities, and that their play is more physical than that of mothers (Parke, 2002; Yeung, Sandberg, Davis-Kean, & Hofferth, 2001). Gottman (1998) found that in their interactions with children, mothers were more verbal and directing, whereas fathers were more physical and arousing. Although the description of these differences was important, further research is needed to understand whether mother and father styles of interaction are linked to specific outcomes for children. There have been a host of studies that have confirmed that mothers' behaviors are linked to concurrent and later child outcomes in language, cognition, and social behavior (Cassidy, 1988; Cummings & Davies, 1994; Hart & Risley, 1995; Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991; Olsen et al., 2002). Recent research has also found that fathers' supportive parenting behavior during parent–child interactions at 24 months was predictive of children's language development at 36 months (Tamis-LeMonda, Shannon, Cabrera, & Lamb, 2004). However, very few, if any, studies have considered the possible contributions of father language input to child outcomes.

1.3.1. Previous research comparing mothers and fathers' language input

To date, there has been limited research in the area of comparing mother and father language, and most existing research in this area was conducted nearly two decades ago. These studies generally were limited by a small sample size and the results of the studies were not always consistent with one another. Nonetheless, they lay the basis for the present study.

Overall, the studies comparing mother and father verbal input to their children have found that fathers, like mothers, engaged in language that was attuned to their children. Fathers adopted a simplified speech register, spoke with a higher pitch, and adjusted their language output in response to changes in their children's language (Fernald, Taeschner, Dunn, & Papousek, 1989; Kavanaugh & Jirkovsky, 1982; McRoberts & Best, 1997; Rondal, 1980). In a meta-analysis of mother/father language use with their children from infancy to middle childhood, Leaper, Anderson, and Sanders (1998) created global categories of input. They found that during parent–child interactions, fathers used less total language, less supportive language, less negative language and more directive and informing language than did mothers. There were no differences in the use of questions or requesting information. Leaper et al. found that effect sizes associated with mother/father differences were larger with infants and toddlers than with older children.

In the present study we consider five broad areas of mothers' and fathers' language input to toddlers and only review studies where a language sample was coded. These five areas are not meant to be exhaustive but are representative of the important language variables that have been studied and shown to influence children's development. These five areas are: parental total verbal output, parental diversity of vocabulary, parental utterance complexity, parental use of questions, and parental pragmatic features of the discourse.

1.3.1.1. Output. Many studies have found that fathers produced less total verbal output than did mothers in interaction with their children, although there was a context effect for some studies. Both Golinkoff and Ames (1979) and Hladik and Edwards (1984) examined mother and father language in a dyadic and triadic situation. Golinkoff and Ames studied 12 middle-class children in 10-minute free play sessions. They found that in the dyadic situation, mothers

and fathers produced a similar number of utterances. On the other hand, in the triadic situation the fathers used fewer utterances than mothers. Hladik and Edwards included 10 middle-class children who participated in 30-minute sessions with their parents alone and together. They found exactly the opposite finding as Golinkoff and Ames: in the triadic situation, there were no differences between mothers and fathers on any variables, but in the dyadic situation, fathers spoke less than mothers did. Rondal (1980) studied five French speaking middle-class families in dyadic free play and story-telling situations and triadic meal situations when the children were 1;6 to 3 years of age. During the five recording sessions, fathers spoke fewer words than mothers.

In contrast, other studies have not found significant differences between mothers and fathers on measures of total output (McLaughlin, White, McDevitt, & Raskin, 1983; O'Brien & Nagle, 1987). A recent study by Rowe, Coker, and Pan (2004) compared fathers' and mothers' talk to toddlers in 33 low-income families. They reported that, in dyadic interactions with their toddlers, mothers and fathers did not differ in the amount of child-directed language. In one of the only previous studies to consider dual-earner middle-class families, Malone and Guy (1982) also found that in a sample of 10 families, fathers and mothers did not differ in total output during dyadic interactions with their 3-year-old sons.

1.3.1.2. Vocabulary. Surprisingly few studies have compared mothers' and fathers' diversity of vocabulary in interactions with their young children. O'Brien and Nagle (1987) studied 10 middle-class European American children and their parents in a free play situation. The children ranged in age from 1;6 to 2 years of age. Rowe et al. (2004) studied 33 Early Head Start children and their parents when the children were 2 to 2½ years of age. These two studies compared mothers and fathers in terms of diversity of vocabulary and found no significant differences. Ratner (1988) studied eight mother–father–child triads, aged 1;6 to 2;0, in free play situations. Ratner found only minor differences between mothers' and fathers' type-token ratio, but found that fathers' speech was characterized by greater use of rare vocabulary and lower use of common vocabulary than was mothers' speech.

1.3.1.3. Utterance complexity. There have been a number of studies that examined the language complexity of mothers and fathers although there is little consensus among the results. McLaughlin et al. (1983) studied 24 middle-class European American children; eight at 18 months, eight at 2½ years of age, and eight at 3½ years of age. They found an overall effect for a shorter MLU for fathers. Rondal (1980) studied five boys who were between 1;6 and 3 years of age. This study also found a shorter MLU for fathers. Malone and Guy (1982) studied 10 first-born 3½-year-old boys from middle-class dual-earner families. They found that fathers had a shorter MLU than mothers and in addition that the five longest utterances of the fathers were also shorter than the mother's five longest utterances.

However, there were six studies that did not find utterance complexity differences between mothers and fathers (Golinkoff & Ames, 1979; Hladik & Edwards, 1984; Hummel, 1982; Kavanaugh & Jirkovsky, 1982, O'Brien & Nagle, 1987; Rowe et al., 2004). These studies were similar to the studies that did find differences with respect to sample characteristics. For instance, these studies also had small sample sizes from 4 to 33 children, similar ages of children from 8 months to 3½ years of age, and generally included middle-class European American families.

1.3.1.4. Questions. Some previous research has suggested that fathers may ask proportionally fewer total questions of toddlers, more wh-questions (open-ended) questions, and fewer yes/no questions than do mothers (Leaper et al., 1998; McLaughlin et al., 1983; O'Brien & Nagle, 1987; Rondal, 1980; Rowe et al., 2004). In contrast, Malone and Guy (1982) found that fathers had a lower proportion of total questions, a lower percentage of wh-questions, and a higher percentage of yes/no questions than did mothers. Again, other studies have not found a significant difference between fathers and mothers in terms of use of questions (Golinkoff & Ames, 1979; Hladik & Edwards, 1984; Hummel, 1982; Kavanaugh & Jirkovsky, 1982; Kruper & Uzgiris, 1987).

1.3.1.5. Pragmatics. A common conversational variable that has been measured in some studies comparing mother and father language input has been conversational turns. While some studies have found that fathers took fewer conversational turns than did mothers (Golinkoff & Ames, 1979; Rondal, 1980), other studies have not found significant differences between mothers and fathers in terms of conversational turns (e.g., McLaughlin et al., 1983). Although there were contextual differences among these studies with respect to the way in which the language samples were obtained, there did not appear to be any consistent patterns that could explain these different findings, except the small sample size.

1.3.1.6. Summary. Most existing work on father language input has focused on the comparison of father and mother language input. However, due possibly to small samples sizes, previous research in this area has not yielded consistent results. The current study included a large sample of dual-earner families to compare mother and father language input during free play interactions when their children are 2 years of age. This study further extends the existing focus on father language input to consider the direct contributions of father language input on early language development.

1.3.2. Links to child language development

Research has shown that parents modify their speech to their young children in ways that support their early language learning through, for example, simplified language that is less complex grammatically, more redundant, and with a higher pitch and exaggerated intonation pattern (Fernald et al., 1989; Kavanaugh & Jirkovsky, 1982; Kitamura & Burnham, 2003; McRoberts & Best, 1997; Rondal, 1980; Snow, 1977). Previous research linking parental language behavior to early child language development has focused primarily on mothers. Results of these studies have suggested that maternal output, vocabulary, complexity of speech and questions may contribute in important ways to children's early language development. However, many of these studies have not controlled for parent level of education. Additionally, most previous studies have considered families in which mothers stayed at home full-time and therefore, did not use center-based nonfamilial child care.

1.3.2.1. Output. Previous research into maternal language has indicated that the amount of talk mothers direct to their children was associated with their children's gains in linguistic abilities (Barnes, Gutfreund, Satterly, & Wells, 1983; Furrow, Nelson, & Benedict, 1979; Huttenlocher et al., 1991). Barnes et al. (1983) considered a sample of 32 children from diverse socioeconomic backgrounds during the second year of life. They found that amount of adult speech was significantly correlated with gains in children's early language skills, in that children who made larger gains in language development also experienced greater amounts of adult speech. Huttenlocher et al. (1991) found similar results with a sample of 22 children, from 14 to 26 months of age. They found that the overall amount of maternal speech input at 16 months accounted for a substantial amount of variation of children's acceleration in vocabulary growth.

1.3.2.2. Vocabulary. The diversity of maternal vocabulary has been a strong predictor of children's later language development and literacy (Bornstein, Haynes, & Painter, 1998; Hart & Risley, 1995; Hoff-Ginsberg, 1991). Hoff-Ginsberg (1991) found maternal vocabulary to be significantly associated with child vocabulary in both working-class and upper-middle-class mother–child dyads. Similarly, Hart and Risley (1995) found that the number of different words used by parents was strongly related to children's early vocabulary.

1.3.2.3. Complexity. While still controversial, the complexity of maternal language input to young children has been associated with young children's language development (Furrow et al., 1979; Gleitman, Newport, & Gleitman, 1984). This finding has not been supported by other studies (Barnes et al., 1983), which have not found significant links between the complexity of maternal speech and child language development.

1.3.2.4. Questions. In a study of 22 mother–child dyads, Hoff-Ginsberg (1985) examined the role of mothers' speech and children's syntactic growth during the second year of life. Hoff-Ginsberg found that frequency of mothers' open-ended, or wh-questions was a significant predictor of children's auxiliary growth. Similarly, Rowland, Pine, Lieven, and Theakston (2003) found in a sample of 12 English children ages 1;8–3;0, that the frequency of mothers' use of particular wh-words and verbs were predictive of children's order of acquisition of wh-questions. In addition, mothers' use of yes/no questions has been related to greater language achievement in children during the 2nd year of life (Furrow et al., 1979).

1.4. Summary of previous research

Previous research suggests that multiple aspects of children's familial and nonfamilial environments influence early language development. This body of research suggests that the interactions between children and adults within and outside of the family shape early language development. While there is considerable research on maternal language input, to date very few, if any, studies have considered the contributions of father language input to early language

development. The present study aims to more fully include fathers in the discourse surrounding parental language input. Previous studies on father versus mother input to young children have found some differences, but many of these findings are not consistent from study to study. These discrepancies may be due to the limited sample size in most of the studies. In addition, most of the studies were done almost 20 years ago with families in which the mother generally did not work outside the home. None of the studies examined the possible influence of father language input on the child's later development. A goal of this study is to develop a model predicting children's expressive language development at 36 months of age that controls for the effects of parent level of education when considering the influence of quality of care and mother and father language input.

The present study builds upon the limited previous research on mothers' and fathers' language input to consider triadic language interactions with a large sample of 92 dual-earner families. It extends the previous body of work in this area by examining multiple sources of influence in the familial and nonfamilial caregiving environments on children's early language development. This study addresses the following research questions:

1. How does the language input of fathers differ from that of mothers during triadic free play sessions in the home when their children were 24 months old?
2. What are the unique contributions of parent education, quality of child care, and fathers' and mothers' language input when their children were 24 months old in the prediction of children's expressive language development at 36 months of age?

2. Method

2.1. Participants

This study used data from the Penn State Health and Development Project, which followed 120 children from center child care entry during the first year of life through 3 years of age. Some data were missing from families because they withdrew their children from child care, were unable to finish their home visit within 6 weeks of their child's 24 month birth date, or videotape data were unusable. Data from 92 families were available for analysis when the children were 24 months old. These 92 families were not found to differ significantly from the original 120 families in terms of parent level of education or hours per week spent in child care. All 92 children had language abilities that fell within the range of typical development at 24 months, as measured using the Sequenced Inventory of Communication Development-Revised (SICD-R; Hedrick, Prather & Tobin, 1984). That is, none of the children included in this study were identified as having language scores that were less than two standard deviations from the mean on the SICD-R. There were 67 children available at 36 months. The missing data generally resulted from the inability of the child to complete the expressive language test and from attrition. Of the 92 children included in the MANOVA dataset, 16 were unable to complete the expressive language test at 36 months. The language test was administered first in the child's home. If the child was not compliant at that time, they were later tested in their child care center. Data were missing for the language test if the child did not cooperate in completing the test in these settings within a 3-month period. The 24 month and the 36 month samples were not found to differ significantly for measures of mothers' level of education, $ps > .23$.

Families were recruited from 11 child care centers before the children were 1 year of age. All families spoke English in the home. All children attended the child care center at least 15 hours per week. The child care centers were located in two counties in central Pennsylvania and represented 31% of all centers enrolling infants in the two counties. Families included in this analysis were married, with both parents living in the home.

During a family interview, mothers and fathers provided information about education, income, child care, and family composition. Table 1 provides detailed demographic information on the families included in this analysis. The average age of fathers in this sample was 36 years, and the average age of mothers was 35 years. While there was some range in levels of education and income, overall, parents in this sample were well educated, with middle-class or upper-middle-class incomes. As can be ascertained from Table 1, the majority of mothers and fathers had college or advanced degrees. All families were European American. These children began daycare at around 3 months of age.

A questionnaire was administered separately to mothers and fathers to gather information about their involvement in caregiving tasks at 24 months. During the family interview, mothers and fathers independently completed the *Who Does What questionnaire* (Cowan, Cowan, Coie, & Coie, 1978). The *Who Does What questionnaire* is comprised of 4 subscales: Family tasks, Caring for the child, Daily care of the child and General satisfaction. Only the Daily care of the

Table 1
Descriptive information of the total sample (N = 92)

	Mean		*SD*
Income (in dollars)			
Father (n = 77)	44,870.13		21,597.00
Mother (n = 83)	37,891.57		21,128.53
Total household (n = 76)	82,894.74		34,334.27
Father's education (n = 86)			
Less than high school (%)		1.1	
High school graduate (%)		7.0	
Some college (%)		22.1	
College graduate (%)		36.0	
Master's degree (%)		22.1	
Ph.D., M.D., J.D. (%)		11.6	
Mother's education (n = 87)			
Less than high school (%)		0	
High school graduate (%)		5.7	
Some college (%)		14.9	
College graduate (%)		48.3	
Master's degree (%)		13.8	
Ph.D., M.D., J.D. (%)		17.2	
Siblings (n = 92)			
Only child (%)		43.48	
Youngest (%)		43.48	
Oldest (%)		2.17	
Middle (%)		6.52	
Twin (%)		4.35	
Child sex (n = 92)			
Male (%)		51	
Female (%)		49	
Day care (n = 92)			
Age of entry (in months)	3.42		2.14
Hours/week	38.22		7.87
SICD-R (n = 67)			
Expressive age (36 months)	39.82		7.42
Who does what (n = 90)			
Daily care of the child			
Mothers weekday	3.98		1.28
Mothers weekend	4.15		1.07
Fathers weekday	4.21		1.39
Fathers weekend	4.55		1.23

child subscale was used in this study. We used this measure to describe the level of involvement of these fathers in their children's lives. While each parent gave him or herself a higher rating of involvement than the spouse did, in this study, correlations between spouses on these subscales ranged from .75 to .87. Internal consistency was strong, with subscale alphas ranging from .92 to .99 (Toutiatos, Perlmutter, & Straus, 1990).

Eighteen items on this questionnaire addressed the daily care of the target child. These items assessed who usually attended to the tasks in daily routines, such as wakening, feeding, daytime supervision, transportation to and from child care, and playtime. For these items, mothers and fathers were asked to rate these aspects of caring for the target child on the following 9-point scale: 1 = "She [mother] does it all," 5 = "We both do this about equally," 9 = "He [father] does it all." Subscales of parent involvement were compiled for the daily care of the child during the week and during weekends. The average of mothers' and fathers' responses on the 9 items addressing daily care of the target child during the week and the 9 items concerning daily care of the target child during weekends comprised the two scores.

The results from this questionnaire indicated that the daily care of the child was fairly well-distributed among mothers and fathers, although on average both mothers and fathers rated the mother as doing slightly more than the father. That is, while both parents were involved in the daily lives of their children, mother and father means on this measure were closer to 1 ("She [mother] does it all"), than to 9 ("He [father] does it all").

2.2. Procedure

Most of the data for this study were obtained from family home visits when the children were 24 months of age. Children's language test data were collected when the children were 36 months of age. At 24 months, families were visited in their homes for approximately 2 h. Both mothers and fathers were interviewed and they filled out a number of questionnaires about themselves and their children. Free play sessions that included the mother, father, and child were videotaped in the families' homes during the 24-month visit. The families were asked to sit on a large mat that was placed on the floor with a set of age-appropriate toys that included a Legos farm theme package, a large wooden puzzle and a lock box. The puzzle had handles that made it easier for young children to manipulate the pieces. The lock box consisted of 20 doors that could be opened by manipulating a variety of different latches, hooks and buttons. There were stickers inside of each door. These toys had been pilot tested with parents in this community to ensure that they were engaging for mothers and fathers as well as 24-month old children. Children wore a vest that contained a wireless microphone so that optimal sound was available for transcription.

During these free play sessions, parents were asked to help their child to play with each of the toys. These play sessions were 20 min in length. Videotaped interactions were transcribed into computer files using the Systematic Analysis of Language Transcripts (SALT) v.8 software program (Miller & Chapman, 1985).

2.3. Measures

The major measures from this study came from the transcriptions of the language during the free play sessions. The language input of mothers and fathers was measured in terms of output, vocabulary, complexity, questions, and pragmatics during triadic free play sessions. Generally, language variables were coded as a total of a particular category and also as a proportion score that controlled for total output.

At 36 months a language test was administered to the children by an experienced graduate student in a quiet room at home or within the child care center when necessary. The quality of child care was measured throughout the study. All of these measures are described in more detail below.

2.3.1. Parent education

During an interview at 24 months, mothers and fathers were asked to identify the category that best described the highest level of education they had attained. Categories included "less than high school", "high school graduate", "some college/associate's degree or technical/trade degree", "college graduate", "mater's degree", and "Ph.D., M.D., or J.D." Categories were later assigned a numeric value (less than high school = 1; Ph.D., M.D., or J.D. = 6).

2.3.2. Quality of child care

For this study, an index of child care quality that combined both structural and process measures was utilized. The index was created by combining a structural quality index, as defined by the NICHD Early Child Care Research Network (1999), with a process quality index, based on the Caregiver Interaction Survey (CIS; Arnett, 1989).

A *structural quality* score was created for each center using guidelines laid out by the American Public Health Association and the American Academy of Pediatrics (APHA/AAP, 1992). Each infant and toddler classroom was rated as being either in or out of compliance (1 = in; 0 = out) with recommended group size and ratio limits. Recommended group size for children from birth to 24 months is six and the child/staff ratio is 3:1. In cases where our classroom age groupings did not exactly match those recommend by APHA/AAP, we used the guidelines for the youngest children in the group. This is the approach used by the State of Pennsylvania in regulating group sizes and ratios. Average scores for ratio and group size were calculated over all classrooms in a given program.

The APHA/AAP guidelines recommend that teaching staff have formal post-high school education or training in child care or child development. Each infant and toddler teacher was rated as meeting this recommendation (1) if she reported having a Child Development Associate Certificate (CDA) or having had some college education in a relevant field. Otherwise she was rated as not meeting this recommendation (0). Since overall level of formal education has also been shown to be associated with child care quality (Berk, 1985; Blau, 2000; Howes, 1997; Vandell & Wolfe, 2000; Whitebook, Howes, & Phillips, 1989), we also scored teachers as having (1) or not having (0) any post-high school formal education, regardless of the discipline. These child-specific and general education scores were averaged across all teachers in a program.

These four factors (ratio, group size, child-specific post-high school education, and general post-high school education) were summed to provide an overall index of the structural quality of the infant and toddler care provided by each center. The possible range of scores was 0–4.

Process quality was assessed using the Caregiver Interaction Survey (Arnett, 1989). A trained observer watched a particular infant/toddler teacher for 45 min, focusing on the quality of her interactions with children, and rated her on the survey. The survey consists of 22 items that are used to generate three subscales: *sensitivity* (10 items), *harshness* (8 items), and *detachment* (4 items). Each of the 22 items is rated on a 4-point Likert scale from 1 (never) to 4 (consistently). Average field reliability (percent exact agreement for the summed subscale scores) for the measure on 10% of the data was .90 for *sensitivity*, .92 for *harshness*, and .86 for *detachment*.

Because there are no norms available for the CIS, we created a process quality index that reflects relative quality across the programs serving our sample. Using a median split for each of the three subscales across all centers, each teacher was rated as being above (1) or below (0) the median for each of the measures of process quality. These scores were then summed and averaged across all infant and toddler teachers by center. This yielded a process quality score for each center that could range from 0 to 3.

The *total quality index* was the sum of the structural quality index and the process quality index. Possible total scores ranged from 0 to 7.

2.3.3. Parent language input

2.3.3.1. Mother and father output. *Total verbal utterances* included all utterances of at least one word. This variable included all utterances except unintelligible utterances, false starts, and reformulations. False starts and reformulations were self-repetitions or changes in the original formulation. For example: (And he) he almost (went) drove himself to the store. The words in parentheses were not counted. *Total words* included all words that the parents used during the 20 minutes session. Omitted and unintelligible words were not included.

2.3.3.2. Mother and father vocabulary. *Number of different word roots* was determined on the basis of unique free morphemes. Omitted and unintelligible words were not included. Variations in the words were not counted as separate root words. For instance, *talk* and *talked* would be considered the same root word. *Type-token ratio* (*TTR*) was the ratio of the number of different word roots to the total words.

2.3.3.3. Mother and father complexity. *Mean length of utterance (MLU)* in morphemes was the average number of morphemes comprising a speaker utterance.

2.3.3.4. Mother and father questions. *Total questions* included all utterances that ended in a question mark. Thus, statements that functioned as questions were counted as questions. *Proportion of questions* was the ratio of total questions to total verbal utterances. *Total wh-questions* were utterances ending in a question mark that included at least one of nine question words (*how*, *what*, *whatcha*, *which*, *when*, *where*, *who*, *whose*, and *why*). *Proportion of wh-questions* was the ratio of total wh-questions to the total questions. *Number of types of wh-questions* included how many of the nine different types of question words were used by the parents.

2.3.3.5. Mother and father pragmatics. *Total conversational turns* included total number of turns taken by the parent during the free play session. A speaker turn consisted of one or more consecutive utterances by a single speaker. If there was more than a 5 second pause between utterances by the same speaker, that utterance began a new turn. *Mean turn length in utterances* was the average number of utterances comprising the parent's turn. *Mean turn length in words* was the average number of words comprising the parent's turn.

2.3.4. Child language

The Sequenced Inventory of Communication Development-Revised (SICD-R; Hedrick et al., 1984) consists of 81 items that measure both receptive and expressive domains of language for children ages 4 months to 4 years. This measure yields an *Expressive Communication Age* (*ECA*), which was used in this study. ECA scores are norm referenced standard developmental ages in months. Interrater reliability has been reported to be 96%. Percent agreement by age-level assignment was 90.48%, and test-rest reliability was 92.8%. Concurrent validity on the SICD-

R was supported by strong correlations with the Peabody Picture Vocabulary Test, r = .75 to r=.80 (N = 147) (Hedrick et al., 1984).

3. Results

3.1. Comparing mothers' and fathers' language input

A one-way MANOVA was performed to investigate how the fathers' and mothers' language input behavior with their 24 month-old children differed during triadic free play sessions.[1] Univariate analyses were performed on each dependent variable as follow-up tests to the MANOVA. A Bonferroni correction was employed to control for the likelihood of making a type I error. The alpha level of .05 was divided by 13, the number of tests conducted, to yield a critical p-level of .0038.

The MANOVA findings for 13 language variables were significant, $F(13, 79) = 5.45$, $p < .0001$, demonstrating that there was an overall difference between mothers and fathers in their language input to their young children. Table 2 presents the univariate statistics for each of the parental language variables. Univariate tests showed that fathers produced significantly fewer *total verbal utterances*, $F(1, 91) = 17.36$, $\eta^2 = .16$, and fewer *total words*, $F(1, 91) = 16.91$, $\eta^2 = .16$, and fewer *total wh-questions*, $F(1, 91) = 9.28$, $\eta^2 = .09$, than did mothers. Fathers used fewer *different word roots*, $F(1, 91) = 39.75$, $\eta^2 = .30$, than did mothers. Fathers took fewer *total conversational turns* than did mothers, $F(1, 91) = 16.60$, $\eta^2 = .15$, and their turns were significantly shorter, both in terms of *utterances*, $F(1, 91) = 13.93$, $\eta^2 = .13$, and *words*, $F(1, 91) = 14.60$, $\eta^2 = .14$. No significant differences were found between mothers and fathers in terms of TTR, MLU, total questions, proportion of questions, proportion of wh-questions and number of types of wh-questions.

3.2. Predictors of children's expressive language at 36 months old

3.2.1. Relationships among background characteristics, parent language at age 24 months and children's expressive language at 36 months

The second research question considered the unique contributions of parent education, quality of child care, and mothers' and fathers' language input when their children were 24 months of age to children's expressive language at 36 months of age.[2] Zero-order correlations were computed to investigate potential intercorrelations among the mothers' language input variables and among the fathers' language input variables (see Table 3). A review of these correlations demonstrated that there were some issues of multicollinearity in the data. In order to address the issue of multicollinearity and to avoid the omission of any important parental language variables, composite variables were created for the parental language domains of interest when appropriate. Because the values of the variables were in different measurement metrics (i.e., totals and proportions), it was necessary to first standardize all of the parent language input variables to have a mean of 0 and a standard deviation of 1.

The composite variables *mother output* and *father output* consisted of total verbal utterances and total words. *Mother vocabulary* and *father vocabulary* consisted of number different word roots. The variable TTR was not included in a composite as it was comprised of variables already included in the analysis and was considered redundant. *Mother complexity* and *father complexity* consisted of the variable MLU. *Mother questions* and *father questions* were comprised of proportion total questions, proportion wh-questions, and number of types of wh-questions. The variables total questions and total wh-questions were dropped from the analysis as they were already captured by the proportional question variables. Lastly, *mother pragmatics* and *father pragmatics* were comprised of total conversational turns, mean turn length in utterance and mean turn length in words. Table 4 displays the zero-order correlations between mother and father language input composite variables.

[1] Preliminary analyses identified several outlying cases and analyses were conducted with and without these cases. The overall results of the analyses remained unchanged with the omission of the outlying cases so all cases were retained in the dataset. Preliminary analyses also indicated that parental language variables did not vary as a function of child sex.

[2] The Bonferroni correction was applied to the identification of outliers using the studentized residuals (Kleinbaum, Kupper, Muller, & Nizam, 1998). One outlying case and one influential case were identified. Analyses conducted with and without these cases resulted in only minor changes to the outcomes and all cases were included in the dataset as a result.

Table 2
Mean (*SD*) scores and follow-up tests of significance for differences in mothers and fathers language during free play with their 24 month-old child ($N = 92$)

Language variable	Univariate $F(1, 91)$	Mothers *M* (*SD*)	Fathers *M* (*SD*)
Output			
Total verbal utterances	17.36**	211.26 (77.70)	161.20 (70.90)
Total words	16.91**	853.15 (327.63)	639.77 (306.92)
Semantics			
No. different word roots	39.75***	192.40 (43.17)	154.42 (41.30)
TTR	7.00	.24 (.06)	.28 (.09)
Complexity			
MLU	6.10	4.29 (.66)	4.12 (.63)
Questions			
Total questions	8.14	69.95 (30.36)	56.05 (28.96)
% questions	1.58	.33 (.09)	.35 (.11)
Total wh-questions	9.28*	30.36 (15.17)	23.36 (13.40)
% wh-questions	.39	.43 (.12)	.42 (.12)
No. of types of *wh*-questions	3.59	4.11 (1.04)	3.84 (1.05)
Pragmatics			
Total turns	16.60**	114.89 (33.44)	99.52 (36.07)
Mean turn length (Utt)	13.93**	1.89 (.51)	1.63 (.30)
Mean turn length (Words)	14.60**	7.56 (2.56)	6.30 (1.64)

*$p < .0038$. **$p < .00077$. ***$p < .000077$.

3.2.2. Predicting child language at 36 months from parental language input at 24 months

To gain a better sense of how different aspects of parental language contribute to children's expressive language development, we conducted separate hierarchical linear regression analyses for each of the five domains of interest: output, vocabulary, complexity, questions, and pragmatics. These individual regression analyses test the contributions of each domain of mother and father language input to child expressive language in isolation. Then, an overall hierarchical linear regression analysis was run that encompassed all of the predictor variables of interest for mothers and fathers with children's 36-month expressive language scores as the dependent variable. This overall regression analysis tests the unique contributions of each mother and father language input variable when considered in conjunction with the contributions of the other variables. Hierarchical linear regression was chosen as an analysis strategy because predictors could be entered into the model in an order that reflects theoretical considerations. For each regression model, parents' level of education was entered in the first step of the regression to control for the potential influence of education on the relationship between parental language input and child language. Total quality of child care was entered as the second step. The third step consisted of parental language input variables.

Table 3
Correlation matrix for language input variables using the raw data ($N = 67$)

	Total utt.	Total words	Number different words	MLU	Percent total questions	Percent wh-questions	Total turns	Mean turn length (utt.)	Mean turn length (word)
	1	2	3	4	5	6	7	8	9
1.	1.00	**.93**	**.76**	**–.06**	**–.03**	**.17**	**.76**	**.61**	**.48**
2	.95	1.00	**.86**	**.30**	**.12**	**.08**	**.62**	**.67**	**.68**
3	.90	.92	1.00	**.41**	**.02**	**.04**	**.58**	**.50**	**.59**
4	.28	.54	.48	1.00	**.42**	**–.25**	**–.21**	**.16**	**.55**
5	–.05	.03	–.07	.29	1.00	**–.13**	**–.11**	**.08**	**.25**
6	–.05	–.03	.08	.02	–.01	1.00	**.29**	**–.06**	**–.15**
7	.91	.85	.87	.22	–.11	.03	1.00	**–.03**	**–.12**
8	.66	.66	.52	.27	.09	–.20	.33	1.00	**.90**
9	.60	.75	.61	.72	.23	–.13	.32	.85	1.00

Note. Values for mother variables are emboldened in the top triangle and values for father variables are in bottom triangle.

Table 4
Correlation matrix for mother and father language input composite variables (N = 67)

	Mother output	Mother vocabulary	Mother complexity	Mother questions	Mother pragmatics	ECA
Father output	−.22	−.07	−.05	−.10	−.33	.28
Father vocabulary		.06	.00	−.07	−.28	.40
Father complexity			.45	−.10	−.05	.35
Father questions				.17	−.26	.20
Father pragmatics					−.40	.30
ECA	.00	.14	.30	.02	.03	

Table 5 presents the results of the each of the five hierarchical regression analyses conducted using each of the parental language input domains, output, vocabulary, complexity, questions and pragmatics as predictors.

Mothers' and fathers' *levels of education* when children were 24 months of age, entered first in all the regression models, accounted for 20% of the variation in children's expressive language abilities, $p < .001$. Specifically, mothers' level of education was a significant predictor, $t(64)=2.60$, $p < .05$. *Quality of care*, assessed at 24 months, accounted for an additional 8% of the variance in children's expressive language skills at 36 months of age, $p < .01$.

As shown in the upper portion of Table 5, the addition of *father output* at age 24 months was a significant predictor of the child's expressive language scores at 36 months after accounting for level of parent education and quality of child care, $t(61) = 2.03$, $p < .05$.

The analysis using parent vocabulary scores as predictors (middle of Table 5) showed that *father vocabulary* use when the child was 24 months old contributed an additional 9% of the variance in child expressive language skills at 36 months, beyond the contributions of parent level of education and quality of care, $t(61) = 3.17$, $p < .01$. None of the maternal language use variables accounted for variance in the child's language scores above and beyond parent level of education and quality of care. The fathers' language variables in the domains of complexity, questions and pragmatics did not significantly explain any additional variance in child expressive language at 36 months.

An overall regression model that included all of the parent language variables was conducted on children's 36-month expressive language scores. The results of this analysis are presented in Table 6. The overall regression model was significant, $F(13, 53) = 4.25$, $p < .0001$. The addition of mother and father language input variables accounted for 11% of the variance in children's expressive language scores, $p < .05$, above and beyond the contributions made by parent level of education and quality of care. Fathers' vocabulary use was the only parental language variable to make a significant independent prediction to later child expressive language development, $t(53) = 3.10$, $p < .01$.

4. Discussion

This study identified several differences between the language input of mothers and fathers to their young children, particularly in the area of language output by parents during free play. Perhaps most importantly, this study linked fathers' language input to children's early language development, finding that fathers' language input to their children at 24 months of age made a unique contribution to children's later expressive language skills at 36 months of age, after parent education and quality of child care was considered.

The results of the first study, conducted with 92 families when children were 24 months old, suggested that fathers produced significantly less verbal output than mothers in a family free play situation. These findings support some earlier research with smaller sample sizes that found that fathers produced less talk and took fewer conversational turns than did mothers (Golinkoff & Ames, 1979; Rondal, 1980); this finding is also consistent with a recent meta-analysis (Leaper et al., 1998). These results support Gottman's (1998) findings that mothers were more verbal than fathers during interaction with their young children. When variables were analyzed that controlled for parental language output, many of the differences between mothers and fathers disappeared. For instance, MLU, Type-token Ratio and proportion of questions did not differentiate mothers and fathers although total different word roots did. Thus, it appeared in this triadic interaction that mothers and fathers differed on the quantity of output but not on the quality of their output. This finding does not support some previous research suggesting that fathers ask a greater proportion of open-ended questions than do mothers (Leaper et al., 1998; McLaughlin et al., 1983; O'Brien & Nagle, 1987; Rondal, 1980; Rowe et al., 2004).

The large language output differences between mothers and fathers found in this study may be contextually related to the triadic nature of these interactions. Parental total output may be connected to family roles and parenting dynamics

Table 5
Summary of five hierarchical regression analyses for variables predicting 36 month-old children's expressive language scores ($N = 67$)

Independent variable	*B*	*SEB*	β	*t*
Control variables				
Step 1: Parent education				
Mother level of education	2.60	1.10	.39	2.38*
Father level of education	.67	1.08	.10	.62
$R^2 = .20$, $F(2, 64) = 9.06$***				
Step 2: Quality of Child Care				
Total quality index	2.03	.69	.34	2.96**
$R^2 = .28$, $F(3, 63) = 9.68$,**** $\Delta R^2 = .08$, F change $(1, 63) = 8.74$**				
Language output				
Step 3: Parent output				
Mother output	.19	.40	.05	.48
Father output	.81	.40	.22	2.03*
$R^2 = .31$, $F(5, 61) = 6.83$,**** $\Delta R^2 = .03$, F change $(2, 61) = 2.06$				
Vocabulary				
Step 3: Vocabulary				
Mother vocabulary	.64	.73	.09	.88
Father vocabulary	2.32	.73	.31	3.17**
$R^2 = .37$, $F(5, 61) = 8.89$, **** $\Delta R^2 = .09$, F change $(2, 61) = 5.58$**				
Complexity				
Step 3: Complexity				
Mother complexity	.88	.85	.12	1.04
Father complexity	1.34	.85	.18	1.57
$R^2 = .33$, $F(5, 61) = 7.40$, **** $\Delta R^2 = .05$, F change $(2, 61) = 3.04$				
Questions				
Step 3: Questions				
Mother questions	.11	.40	.03	.27
Father questions	.70	.40	.19	1.73
$R^2 = .30$, $F(5, 61) = 6.61$, **** $\Delta R^2 = .02$, F change $(2, 61) = 1.68$				
Pragmatics				
Step 3: Pragmatics				
Mother pragmatics	.25	.40	.07	.62
Father pragmatics	.64	.36	.21	1.79
$R^2 = .30$, $F(5, 61) = 6.57$, **** $\Delta R^2 = .02$, F change $(2, 61) = 1.61$				

Note. Steps 1 and 2 (introduction of control variables) produced the same results for each of the five analyses so they are presented only for the first analysis.
*$p < .05$. **$p < .01$. ***$p < .001$. ****$p < .0001$.

(Cox & Paley, 1997; Minuchin, 1985), with mothers dominating the interactions. At the same time, these triadic family interactions may reflect the language input often experienced by young children when both parents are present, suggesting the ecological validity of such interactions (Cox & Paley, 1997).

Results from the regression analyses indicate that parents' level of education, total quality of child care and earlier paternal language input, at 24 months, made unique contributions to children's expressive language development. Specifically, fathers' number of different word roots made a significant contribution to children's expressive language scores at 36 months above and beyond the contributions of parents' level of education and quality of the child care environment. This finding suggests that fathers who used a greater number of different word roots during free play situations had children who had more advanced expressive language skills 1 year later. This finding may be important in understanding children's later school success and literacy. Hart and Risley (1995) found that maternal vocabulary input was related to the children's later language and literacy success in school. The addition of fathers' language to such studies may make the relationship to later language and literacy even clearer.

Table 6
Summary of hierarchical linear regression analysis for overall model predicting 36 month-old children's expressive language scores ($N = 67$)

Independent variable	*B*	*SEB*	β	*t*
Step 1: Parent education				
Mother level of education	2.60	1.10	.39	2.38*
Father level of education	.67	1.08	.10	.62
$R^2 = .20$, $F(2, 64) = 9.06$***				
Step 2: Quality of Child Care				
Total quality index	2.03	.69	.34	2.96**
$R^2 = .28$, $F(3, 63) = 9.68$, ****$\Delta R^2 = .08$, F change (1, 63) = 8.74**				
Step 3: Parental language input				
Mother output	−.25	1.36	−.07	−.19
Father output	−2.48	1.57	−.66	−1.58
Mother vocabulary	−1.58	1.88	−.21	−.84
Father vocabulary	7.43	2.40	1.00	3.10**
Mother complexity	1.82	1.07	.25	1.71
Father complexity	−.69	1.14	−.09	−.60
Mother questions	.06	.41	.02	.14
Father questions	.14	.48	.04	.29
Mother pragmatics	.88	1.17	.25	.75
Father pragmatics	.16	1.03	.05	.16
$R^2 = .39$, $F(13, 53) = 4.25$, **** $\Delta R^2 = .11$, F change (10, 53) = 2.11*				

*$p < .05$. **$p < .01$. ***$p < .001$. ****$p < .0001$.

It was somewhat surprising that mothers' language input was not found to predict children's language development, after controlling for level of education and quality of child care. On average, the mothers in this sample used a large number of different words in their interactions with their children. Mothers used significantly more different word roots than did fathers. Therefore, these findings may have resulted in a threshold effect for parental language input. It may be that because nearly all of the mothers in this sample were creating a communicative environment of many different kinds of words, the relative impact of their language input was not related to their child's language skills. Perhaps this sample was at very low risk for developmental delays. However, when parents' vocabulary falls below such a threshold, as may be more likely to occur with fathers in this sample, children's later expressive language development may be negatively impacted. This is an issue that should be addressed in future research on fathers' and mothers' potential roles in their children's language development.

Previous work linking maternal speech to child language development has not often controlled for effects of parents' level of education and quality of child care. This relatively homogenous sample and our stringent controls may have contributed to the lack of effects of maternal language input on children's expressive language development. Also, we relied on a standardized measure of children's overall expressive language development, which has several advantages, but a naturalistic language sample might have allowed for a more detailed examination of more specific aspects of child language development as they relate to maternal language input.

These findings of the present study reflect the complex interaction and influence of multiple factors in the communicative environment of young children. The results for quality of child care suggest that parents and nonfamilial caregivers, such as daycare providers and early childhood educators, make meaningful contributions to the early expressive language development of young children. This study lends support to the growing body of research that higher quality child care predicts stronger language skills during the first 3 years of life (Burchinal et al., 1996; Burchinal et al., 2000; Feagans et al., 1995; McCartney, 1984; NICHD Early Child Care Research Network, 2002). Like the NICHD study (2002), the present study found that although the quality of child care was important in predicting child language, parent education and parent language, at least fathers', accounted for additional variance in predicting child language. The implications of these findings are that overall quality of care during the first 3 years of life may make important contributions to early language development. Intervention efforts to improve child language development should expand their focus to target the quality of center-based care available to young children and families.

The finding that fathers' vocabulary to children at 24 months of age made unique contributions to their later language development, above and beyond those contributions from parental level of education and quality of child care, highlights the need to include fathers in future research on early language development, and also in program planning and early

intervention efforts. For two-parent dual-earner families, fathers may make important contributions to children's early language skills and should be included in all efforts to improve language development and school readiness.

Although parent–child language interactions have been considered an important context of early language development, too few previous studies have adequately examined differences between the language input of mothers and fathers, and their unique contributions to children's early language development. Results from this study provide a deeper understanding of the multiple influences on children's language development in contemporary families, and highlight the importance of including fathers in future work exploring the impact of parental language input on children's early language development. Specifically, these findings suggest that the role of dual-earner fathers in the early language development of young children might be important. The language input of fathers in the areas of output, vocabulary, complexity, questions, and pragmatics should be explored in more depth in future research in other contexts. In addition, the contributions of parents' language input could be better understood if other aspects of family interactions were investigated, such as the quality of parents' interpersonal or co-parenting relationships. Future research into parents' language should consider the contributions of both mothers and fathers from more diverse samples of families from different cultural groups and income levels in order to better understand variations in parents' language input and its relationship to children's development.

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